THE MICRO WORKS

2708 EPROM SYSTEM BOARD
PSB-08
OWNER'S MANUAL

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2708 EPROM SYSTEM BOARD

TABLE OF CONTENTS

Introduction.....1
Unpacking and Installation.....1
How It Works.....2
Memory Addressing.....3
Modifications to the SWTPC 6800.....4
Schematic.....5
I/O Memory Relocation.....7
User's Memory Map.....9
Patches for I/O Relocation.....10
PSB-08 Parts List.....10
Warranty and Repairs.....11

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INTRODUCTION

Thank you for purchasing a Micro Works PROM System Board. Every effort has been made in the development of the PSB-08 to provide you with a long lasting, trouble free computer accessory. We suggest that you read this manual thoroughly before installing the PSB-08.

The Micro Works PSB-08 is designed to hold up to 8 2708 EPROMs, and includes 1K (1024 bytes) of on board RAM to serve as a scratch pad for whatever operating system the user wishes to implant in EPROM. Each 2708 contains 1K of memory, for a possible total of 8K of contiguous ROM. Both the EPROM and the RAM are memory addressable by means of DIP-switches, a feature which allows instant address changing without the use of a soldering iron.

The 2708 EPROM, now available inexpensively from a number of sources, provides the hobbyist or systems developer with a versatile source of ROM for permanent memory. The "E" in EPROM stands for erasable; the EPROM may be erased and re-programmed by the user as needed. The EPROM is erased by exposure to high-intensity short wave ultraviolet light at a wavelength of 2537 Å, which is easier than it might sound, since there are a number of EPROM erasers on the market. The "P" in EPROM represents programmable; this means that the user may, starting with a fully erased EPROM, program the device to the desired specifications. A programmer, such as the Micro Works B-08 EPROM Burner, is required for this purpose.

The Micro Works is certain you will find your computer system more efficient after the PROM board is installed. The sections in this manual describing I/O memory relocation and replacement of the MIKBUG® operating system provide examples of the increased flexibility available to you. We look forward to hearing any suggestions or comments from our customers.

UNPACKING AND INSTALLATION

Carefully remove the PSB-08 from the box and unwrap the packing material. Take time to inspect the PC board for any damage which may have been incurred in shipping. If there is any damage, save all packing materials and notify the carrier immediately.

Your PSB-08 contains MOS integrated circutiry which may easily be damaged by static electrical sources. Avoid over-handling and do not allow anything to come into contact with the conductors on the board. Never lift the board out of, or plug it into, a computer which is turned on.

Important: If your system has a +19 volt power supply, such as the Smoke Signal Broadcasting PS-1, make sure that your PSB-08 has a 7812 voltage regulator installed with a heat sink before plugging it in. If this optional voltage regulator has not been installed, a modification kit is available from The Micro Works for $5.00 plus postage and handling.

We urge you to make sure that your SWTPC 6800 system has been completely tested before you install the PSB-08. You should at least ascertain that the CPU board operates properly with the on board RAM, in accordance with the SWTPC instruction manual.

After addressing memory, as described on the following page, the PSB-08 may be installed in any of the seven positions available on the SWTPC mother board. Be sure that the power is off during installation.

HOW IT WORKS

The address and data line buffering are provided by U21, U22, U17 and U18. Address selection is supplied by U19 and the two address switches, S1 and S2. U19 monitors the state of address lines A13-A15, and is gated by $\overline{VMA}$ and $\overline{\emptyset 2}$. Its output selects $\overline{ROMSEL}$ or $\overline{RAMSEL}$ when the address on the bus corresponds with the selected switch position. U20, which deciphers the PROM chip being addressed by decoding A10-A12, is enabled by $\overline{ROMSEL}$. When used, $\overline{IO\ SEL}$ disables the output buffers in U17 and U18 when the I/O area of memory is placing data on the bus.

MEMORY ADDRESSING

Prior to installing the PSB-08, address both segments of memory properly. There are two 16-pin DIP-switches for address selection on the board which are labelled S1 and S2. The numbers 0 through E are printed on the PC board directly to the right of each DIP-switch. These silkscreen markings indicate the starting address of the memory block X 1000_{16}. See Table 1. To address either segment of memory, simply flip the switch for the desired memory locations to the closed position. Note that only one switch may be closed on each DIP-switch.

RAM SEL: The 1K RAM on the PSB-08 is addressed by setting the RAM SEL switch (S1) to the position referencing the desired memory locations. The RAM can be utilized to provide a significantly larger scratch pad than is available on the SWTPC CPU board. In order to implement this capability, the 128 byte RAM on the CPU board must be disabled (see Modifications section for instructions). Once this change has been made, the 1K RAM is addressed by setting the RAM SEL switch (S1) to position number 6 which references memory locations $A000_{16}$ to $BFFF_{16}$. Note that 1K of memory will occupy positions from $A000_{16}$ - $A3FF_{16}$. The remaining locations ($A400_{16}$ - $BFFF_{16}$) will be an echo of that 1K of RAM.

ROM SEL: The ROM SEL switch, S2, addresses the ROM to an 8K block of memory. Custom monitors require addressing the ROM to locations from $E000_{16}$ to $FFFF_{16}$. When doing this, you must place a PROM in the location labelled U8, with the reset vectors contained in the last 8 bytes. These vectors are provided in the Micro Works 2708 Utility. The reset vectors will direct the computer to an operating system starting at location $E000_{16}$.

Switch selected	S1 1K RAM Address Location	S2 8K ROM Address Location
0	0000-03FF	0000-1FFF
2	2000-23FF	2000-3FFF
4	4000-43FF	4000-5FFF
6	6000-63FF	6000-7FFF
8	8000-83FF	8000-9FFF
A	A000-A3FF	A000-BFFF
C	C000-C3FF	C000-DFFF
E	E000-E3FF	E000-FFFF

TABLE 1

MODIFICATIONS TO THE SWTPC 6800

The following modifications to the SWTPC 6800 computer may be desirable for those users who wish to utilize the full potential of the Micro Works PSB-08. The first modification allows the user to replace the 128 byte scratch pad RAM on the CPU card with the 1K RAM on the PROM board, as was mentioned in the section on memory addressing. Modification 2 disables both MIKBUG^{R} and the scratch pad RAM on the CPU board. If the user wishes to replace MIKBUG^{R} with a custom monitor located on the PROM board, modification 2 will be necessary. Please see the notes on I/O memory relocation which refer to operating system addressing and memory location on the PSB-08.

Modification 1, (disable CPU board scratch pad RAM)

1. On the bottom of the SWTPC CPU board cut the foil backing from IC 16, pin 10 to IC 16, pin 13. The cut should be made close to pin 10.

2. Connect a jumper wire from IC 16, pin 13 to IC7, pin 3.

3. On board RAM for the SWTPC CPU is now disabled.

Modification 2, (disable CPU board scratch pad RAM and MIKBUG^{R})

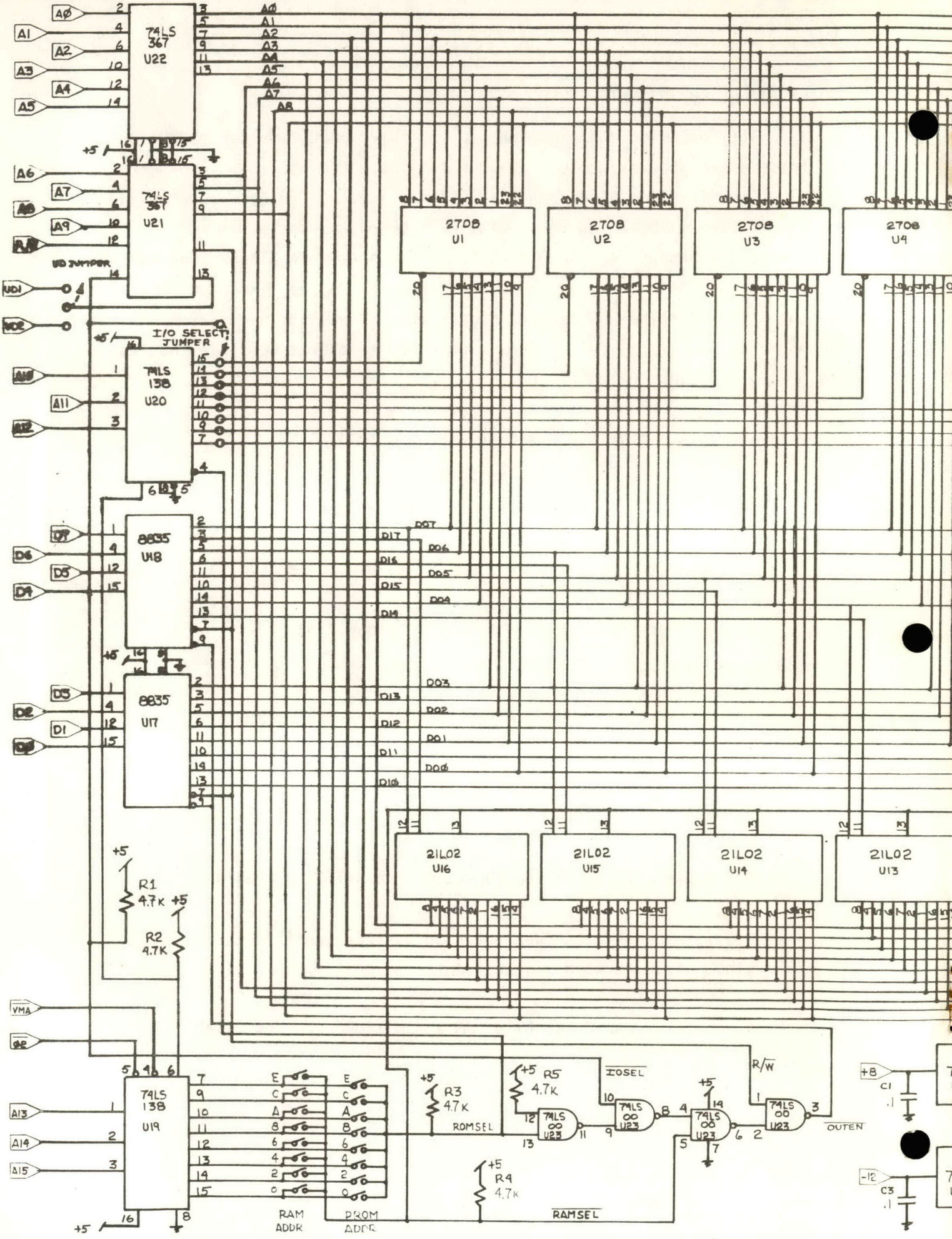
1. Remove IC 16, (a 7420) from the socket on the SWTPC CPU board.

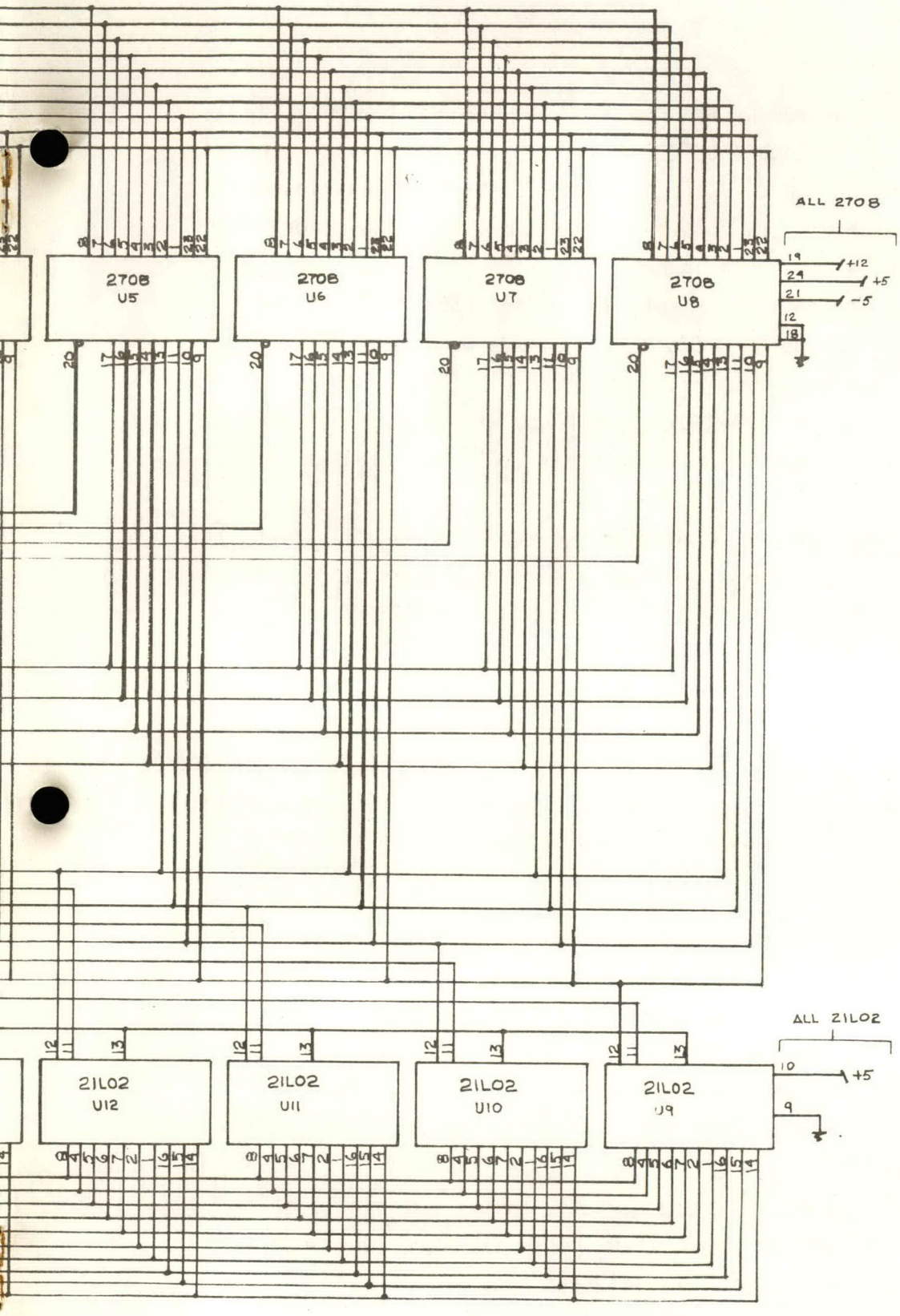
2. Bend pin 8 on IC 16 out away from the chip.

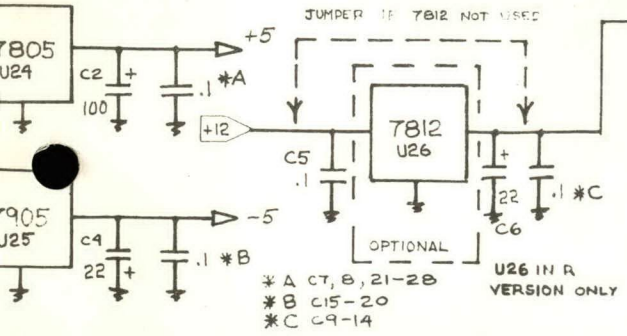
3. Replace IC 16 in the socket on the SWTPC CPU board.

3.5 (If your system does not have sockets installed, simply cut pin 8 of IC 16 with diagonal cutters.)

4. Both on board 128 byte RAM and MIKBUG^{R} are now disabled.


A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
74LS 367 U22
74LS 367 U21
74LS 138 U20
74LS 138 U19
8835 U18
8835 U17
UD JUMPER
UD1
UD2
I/O SELECT JUMPER
2708 U1
2708 U2
2708 U3
2708 U4
21L02 U16
21L02 U15
21L02 U14
21L02 U13
D07
D06
D05
D04
D03
D02
D01
D00
D17
D16
D15
D14
D13
D12
D11
D10
R1 4.7K
R2 4.7K
R3 4.7K
R4 4.7K
R5 4.7K
VMA
ΦR
A13
A14
A15
RAM ADDR
PROM ADDR
ROMSEL
RAMSEL
IOSEL
R/W
OUTEN
74LS 00 U23
+5
+8
-12
C1
C3
.1





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PROM SYSTEM BOARD

PSB-08

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I/O MEMORY RELOCATION

A useful option provided by the PSB-08 is input/output memory relocation capability. In the stock SWTPC 6800 the memory locations allotted to I/O are at locations 8000_{16} to $801F_{16}$. With a 16 bit bus capable of addressing memory through $FFFF_{16}$, this configuration places I/O memory right in the middle of potentially available RAM. In order to relocate this section of memory, the I/O bus option must be selected on the PSB-08. This restricts the user to 7K of EPROM on the PROM board, but allows up to 56K of contiguous RAM to be installed. Software that calls the 8000_{16} to $801F_{16}$ area must be modified; patches for MIKBUG^R, SMARTBUG^R, and RT-68 are included in this manual, as well as updates for the popular SWTPC programs CORES and 8K BASIC V. 2.0.

It is assumed that the user contemplating this option will select the PSB-08 PROM area to $E000_{16}$ - $FFFF_{16}$ and copy the desired operating system into EPROM(s) starting at $E000_{16}$. This will require another EPROM to be located at $FC00_{16}$ - $FFFF_{16}$ (U8 on the PSB-08) containing the restart vectors. PROM not used for the reset vectors will be available to the user.

The I/O space may be moved to any 1K block that corresponds to an EPROM location on the PSB-08. $F800_{16}$ - $FBFF_{16}$ is suggested as a standard since it allows maximum contiguous EPROM space on the PROM board. The following instructions will accomplish the move to $F800_{16}$ - $FBFF_{16}$.

1. On the PSB-08, connect a jumper wire from I/O SEL to hole #C as shown in Figure 1.
2. On the PSB-08, connect a jumper wire from I/O SEL to UD1 as shown in Figure 2. (UD2 may be used, but we suggest standardizing on UD1.)
3. On the SWTPC mother board remove IC 6, one of the 74S138s.
4. Solder a jumper wire from the UD1 line to pin 11 of the socket just vacated by IC 6.

4.5 (If your system does not use sockets, simply cut pin 11 of IC 6 on the top of the mother board, then solder the wire mentioned in in step 4 to the hole pin 11 was soldered into.)

5. On the PSB-08, make sure the ROM SEL switch is set for "E" and the RAM SEL is selected for "A".
6. The I/O is now at $F800_{16}$ - $FBFF_{16}$! When expanding RAM, the on board 1K may be disabled or moved up to "C" when expansion passes "A".

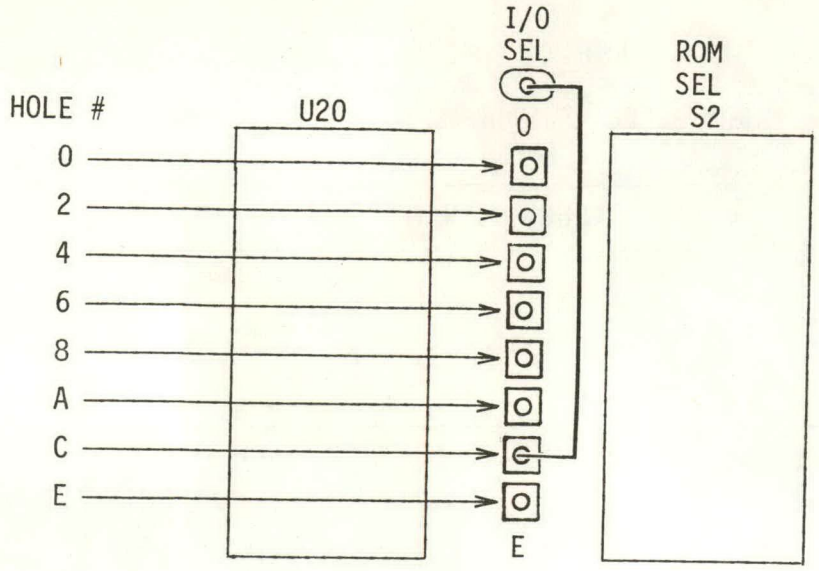

FIGURE 1

Example: The ROM Select switch (S2) is addressed at $E000_{16}$ in Table 2 below.

I/O SEL HOLE #	I/O BUS APPEARS AT EPROM #	I/O BUS ADDRESS START	END
0	U1	E000	E01F
2	U2	E400	E41F
4	U3	E800	E81F
6	U4	EC00	EC1F
8	U5	F000	F01F
A	U6	F400	F41F
C	U7	F800	F81F
E	U8	FC00	FC1F

TABLE 2

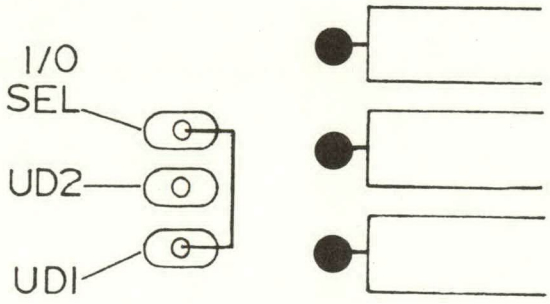

FIGURE 2

PSB-08 MEMORY MAP

ROM SELECT SWITCH (S2), ADDRESS __000

EPROM #	PROGRAM NAME	ADDRESS START	ADDRESS END
U1		__000	__3FF
U2		__400	__7FF
U3		__800	__BFF
U4		__C00	__FFF
U5		__000	__3FF
U6		__400	__7FF
U7		__800	__BFF
U8		__C00	__FFF

PATCHES FOR I/O RELOCATION

MIKBUG®

E00D	F8
E0D7	F8
E0E6	F8
E0E9	F8
E1A9	F8

SMARTBUG®

E00D	F8
E0DC	F8
E0E7	F8
E1AD	F8
E1B3	F8
E1DB	F8
E1E2	F8

RT-68

E017	F8
E14E	F8
E1BD	F8
E1C0	F8
E26C	F8
E299	F8
E29C	F8
E38B	F8

8K BASIC V. 2.0

03A4	F8
03AB	F8
0C41	A0
11FC	F8

CORES Editor/Assembler

1680	F8
17A3	F8
1A87	F8
1A60	F8
1A70	F8
*1A16	F8
*0296	F8
*029B	F8
*029E	F8

*Depends on your version of Cores. If you are not changing an 80 to F8 when entering these patches, leave the original value alone. Due to the 20 or so versions of CORES issued by SWTP, some experimentation may be required to get yours to run.

PSB-08 PARTS LIST

INTEGRATED CIRCUITS

U1-U8.....2708 EPROM (Not supplied)
U9-U16.....2102 RAM (350 ns.)
U17 and U18.....8835 Data Buffers
U19 and U20.....74LS138 Address Decoders
U21 and U22.....74LS367 Address Buffers
U23.....74LS00
U24.....7805 +5 Voltage Regulator
U25.....7905 -5 Voltage Regulator
U26.....7812 +12 Voltage Regulator (Optional)

RESISTORS

R1-R5.....4.7K, ¼ watt

CAPACITORS

C1, C3, C5 and C7-C28..... .1 Mfd. Ceramic
C2.....100/16V Electrolytic
C4 and C6.....22/35V Electrolytic

LIMITED WARRANTY

The Micro Works warrants its products to be free from defects in workmanship and materials for a period of ninety (90) days from the date of purchase. IT IS EXPRESSLY AGREED THAT THIS NINETY (90) DAY WARRANTY SHALL BE IN LIEU OF OTHER EXPRESS WARRANTIES, WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY. No agent, representative, or employee of the Company has authority to increase or alter the obligation of this warranty.

This warranty shall not apply to any Micro Works product which has been modified, repaired or altered in any way. This warranty shall not apply to any product damaged as a result of abuse, misuse, accident or neglect. In no event shall The Micro Works be liable for consequential damages.

In order to make a claim against this warranty the defective board must be returned by private carrier or the U.S. Postal Service to THE MICRO WORKS, P.O. BOX 1110, DEL MAR, CALIFORNIA, 92014. Boards must be accompanied by return shipping charges and the sales receipt showing date of purchase. It is suggested that boards shipped through the United States mails be insured.

REPAIRS

At any time after the expiration of the 90 day warranty period, The Micro Works will repair your PC board for a fee of $25.00, provided that the board is not physically damaged, and that not more than two chips require replacement. If the flat fee is not applicable, you will be notified before further repairs are made. If repairs are necessary, repack the board carefully and enclose a check to The Micro Works, P.O. Box 1110, Del Mar, CA, 92014.